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Mushrooms and Toadstools.

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What is a toadstool? The answer of the botanist is that a toadstool is any one of the fleshy umbrella-shaped fungi which commonly are called by that name or by the name of "mushroom." The popular desire, however, seems to be to restrict the name "toadstool" to the poisonous species and that of "mushroom" to the edible species. This is, however, very unsatisfactory, since one cannot tell, except by trial, whether a particular toadstool is poisonous or not. **Edible, innocent, and poisonous toadstools.** A few toadstools are *extremely poisonous*, a considerable number are probably *slightly poisonous*, most toadstools are *innocent*, i. e., not poisonous, and some of the innocent species are *edible*. Edibility implies that only those innocent species which are of fair size, sufficiently delicate texture, and of agreeable flavor are to be included in the list.

How may one tell an innocent from a poisonous toadstool? The popular mind always seeks some test which may be applied. Such a test should, of course, be decisive and of uniform result. Many reputed tests pass current and are implicitly believed in by some. So far as is known there is no single test, short possibly of chemical analysis, which will give results of any value whatsoever! It may be well to mention some alleged tests in order to emphasize their *unreliability* and their *danger*.

UNRELIABLE TESTS.

1. The so-called "*Silver Test*" is one most prevalent. It is believed that a silver spoon or coin placed with the toadstools while cooking will demonstrate by blackening or failure to blacken whether the toadstools are safe to eat or not. It need only be said in criticism that there are *both poisonous and innocent species which act alike on silver*. *This test is therefore of no value.*

2. Some say that if the outer (upper) skin of the top of the toadstool *peels* off readily, that such a species is edible. It may be said that certain edible species will "peel" and other edible species will not "peel." Some poisonous species also will "peel." So there is *no reliance* to be placed on this "test."

3. It is alleged that edible toadstools while raw have an *agreeable flavor* when tasted (in minute quantities as a rule) while poisonous species are *bitter* or *peppery*, or even *disagreeable* in flavor. Some disagreeably flavored toadstools are innocent and even of agreeable flavor when cooked, while some others are looked upon with suspicion and reputed poisonous. The most poisonous toadstools, however, are, at least, not at all disagreeable as regards the flavor of the raw flesh. Consequently, this test offers *no certain way* to distinguish poisonous from innocent or edible toadstools.

4. When one breaks open a toadstool or bruises it, it may *change color* or it may not. Sometimes the change is to light or to dark blue, sometimes to a reddish or brownish tint of darker or lighter hue. This may or may not be significant, but it is no reliable test of a general character. In general, any decided change of color should arouse suspicion, but the lack of it gives no indication whatsoever as to the nature of the toadstool.

5. Some toadstools when broken open show a *milky juice*. This is usually white but may be red, orange, or blue. Some such toadstools are regarded as poisonous, others are well known to be innocent, and some are delicious eating. On the other hand the lack of a milky juice is no evidence of either non-poisonous or of poisonous character.

6. Many, if not all, toadstools are liable to be *infested by insects*, whose larvae are often so abundant within the plant (often without any external evidence of it) that the toadstools are fairly honeycombed by their ravages. Some take this as an indication of a non-poisonous nature on the part of the toadstool. Experience has shown, however, that this is not so, but that the insects attack both poisonous and non-poisonous species.

MORE CERTAIN METHODS.

There are, then, *no tests to be applied with any certainty* and the question still before us, is: How may one tell the poisonous from the innocent species? There are two methods:

I. **By eating them!** This is, however, a tedious process and one attended with more or less danger. It is not to be recommended, especially to the beginner. If tried, the following process is usually recommended. A very small bit of the raw toadstool is chewed but none of the juice swallowed. If after 24 hours no disagreeable result is experienced, a similar bit is chewed and some of the juice swallowed. If after a similar interval, no disagreeable symptoms result, a small piece may be chewed and swallowed. If nothing suspicious occurs after 24 or 36 hours, a fair quantity may be tested by cooking and eating. It is proper to warn the novice that this may be done safely only after learning to distinguish the most poisonous species (especially the species of *Amanita* mentioned later on), since of some of these it needs only a very small piece to produce serious poisonous effects.

II. **By learning of the experience of others.** There has been accumulated a certain amount of knowledge concerning the innocent or poisonous character of toadstools. While this body of knowledge is not complete and while there are certain parts of it about which there is lack of agreement, a considerable number of toadstools are well known to be either poisonous or edible. How then is one to avail himself of this knowledge? By studying the toadstools and the various books written on the subject. Much that is reliable and satisfactory may be learned in this way. One must learn to know the various kinds of toadstools as one learns to know the ordinary plants of hill and forest and garden.

What are the distinguishing marks of difference among toadstools?

I. In general, each toadstool possesses an upper flattened horizontal structure which is usually called the "cap," or botanically, the "pileus," and a stalk, botanically called the "stipe." In some cases, the stalk or stipe fits into a swollen cup-like structure at the base which is called the "volva." *The presence or absence of a volva is a matter of considerable importance; consequently in studying toadstools one should be careful to obtain the very base.* Many toadstools have a sort of ring or collar encircling the stipe somewhere between the base and the pileus.

II. Structures of very great importance are those found on the under side of the cap or pileus. This portion of the pileus is called the "*hymenium*." By the difference in the structure of the hymenium, toadstools may be divided into four classes, as follows:

1. *Hymenium smooth.* There are not many toadstools in this group and few of them of a texture sufficiently soft to allow of eating. There are no poisonous species known in this group.

2. *Hymenium spiny.* These are called "Hedgehog Toadstools or Mushrooms." The species possible of being eaten are few and none of them, so far as is known, is poisonous.

3. *Hymenium porose.* The hymenium in the toadstools of this group is made up of closely crowded tubes, perpendicular to the horizontal diameter of the pileus, as may be seen by breaking the pileus open. It is the mouths or openings of these tubes which give the surface of the hymenium its porous or spongy appearance. There are many species in this group; some are innocent and some are poisonous. They are all to be avoided by the beginner until he has learned to distinguish them from the descriptions or pictures in the books or has had the distinguishing characters pointed out by one who is acquainted with them.

4. *Hymenium made up of "gills."* "Gills" are flattened, knife-blade-like structures radiating out from the center of the lower side of the pileus or cap to the circumference. Some extend from the place where the stipe joins the under side of the pileus to the circumference, while shorter ones extend from some point farther out to the circumference. By far the larger number of toadstools are of this fourth class and are called "Agarics." The Agarics are divided into 5 subclasses by the color of their spores. In order to determine the color of their spores it is necessary to remove the pileus (which should be fairly young and fresh) from the stipe and place it, hymenium-side down, on a piece of paper, preferably of a light gray, brown, or blue. It is also advisable to cover the pileus with a tumbler or dish so as to prevent too rapid drying. In from one hour to several, according to the species, the spores, which are the minute bodies from which the toadstools grow again, will be expelled from the surface of the gills onto the paper in such quantity as to indicate the color. The colors are as follows:

(a) *White.* The majority of Agarics are in this subclass. Those of this subclass having a cup or swollen bulb at the base accompanied by a ring half to three-quarters up the stipe are to be avoided, for these belong to the species of *Amanita* and some of them are among the most poisonous of toadstools. Those of this subclass having the solid portion of the pileus thin in proportion to the gills and in which the gills are nearly all of equal length are to be avoided, especially if the top of the pileus is bright colored. Avoid also all of this subclass having a milky juice, unless the juice is reddish. Other white-spored Agarics may be eaten, at least cautiously at first.

(b) *Black.* Black-spored Agarics are all innocent and especially those in which the gills, when old, change into inky fluid. They are to be eaten, however, before the gills turn black.

(c) *Ochre.* In these the spores are yellowish or rusty brown. None of the species is reputed poisonous.

(d) *Brown.* The spores are dark brown or purplish brown. The common mushroom, with gills which are pink changing to purplish black, and with a distinct ring on the stipe, belongs here and is edible as are most of the species. Some, however, are under suspicion.

(e) *Rose or Red.* Some of the pink-spored forms are under suspicion, but those with deep red spores and a volva, but without a ring, are edible.

WHAT TO AVOID.

1. All toadstools in the young or "button" stage. At this time it is impossible to determine, except after long experience, some poisonous species from some edible species.

2. Avoid all those with pores on the under side of the cap until sufficient acquaintance teaches the difference between edible and poisonous varieties.

3. Avoid all species with gills, white spores, a ring, and a volva or bulb-like base. The most poisonous species are in this group.

4. Avoid those having a milky juice unless the milk is red.

5. Avoid those having the cap thin in comparison with the gills, especially if they are bright colored.

6. Avoid all toadstools which are not strictly fresh since decay sometimes greatly increases poisonous substances. By following these rules implicitly one may avoid the most poisonous kinds, but the novice should experiment with the greatest caution.

Nature of Toadstool Poisons. Atkinson's account or that of Chesnut recommended in the list of books should be consulted for definite information.

Nutritive Value of Toadstools. In general, it may be said that even the most nutritious toadstools are of little nutritive value but are valuable as food accessories or condiments, not, in any wise, as substitutes for the meat or vegetable ordinarily consumed.

Cultivation of Toadstools. The details are to be learned from special books and pamphlets. The accounts in the books by Atkinson, Duggar, and Hard in the list given below are all excellent.

Books. In general, those interested should consult the various books and pamphlets on the subject, which will lead to the knowledge of other sources of information. Some to be found (or which ought to be found) in many Public Libraries are the following:

*Atkinson, George F. *Mushrooms Edible, Poisonous, etc.* (Ithaca, N. Y. Andrus & Church, 1901).

Chesnut, V. K. *Thirty Poisonous Plants of the United States* (U. S. Dept. of Agriculture, Farmers' Bulletin, No. 86. Washington, 1898).

Clements, Frederic E. *Minnesota Mushrooms* (being IV of "Minnesota Plant Studies," published by the University of Minnesota, Minneapolis, Minn., 1910).

Duggar, B. M. *The Principles of Mushroom Growing and Mushroom Spawn Making.* (U. S. Dept. Agriculture, Bureau of Plant Industry, Bulletin No. 85, Washington, 1905.)

*Farlow, W. G. *Some Edible and Poisonous Fungi.* (U. S. Dept. Agriculture, Division of Vegetable Physiology and Pathology, Bulletin No. 15, Washington, 1898.)

Gibson, W. Hamilton. *Our Edible Toadstools and Mushrooms and How to Distinguish Them* (New York, Harper & Brothers, 1895).

*Hard, M. E. *The Mushroom Edible and Otherwise, its Habitat and its Time of Growth.* (Columbus, Ohio, The Ohio Library Co., 1908.)

McIlvaine, Charles. *One Thousand American Fungi.* (Indianapolis, Ind., The Bowen-Merrill Company, 1900.)

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*These are especially recommended for first reading.